Applied Physical Science
Work, Energy, and Power

Course Objectives

1. Define work in terms of force and distance.
2. Describe the Law of Conservation and Energy.
3. Define potential and kinetic energy.
4. List the different types of energy and give examples of each.
5. Identify common units of energy.
6. Explain the Second Law of Thermodynamics.
7. Define energy efficient.
8. Define power.
9. Identify common units of power.
10. Explain how friction and inertia affect power efficiency.
11. Define machine.
12. Describe the 6 simple machines.

Key Terms (Define the following)

work - _____

_____

potential energy - _____

_____

kinetic energy - _____

_____

Principles

Forms of Energy

Energy Form	Description	Example
Mechanical Energy	The energy associated with the motion or position of an object.	Pinball and spring
Chemical Energy	Potential energy stored in the bonds that hold the atoms together in a molecule.	Food energy, chemical reactions
Thermal Energy	(Also known as Heat) The energy caused by the vibration of atoms and molecules within a substance.	Steam
Electromagnetic Energy	The energy of moving electrical charges.	Battery, lightning, electric turbines
Radiant Energy	Energy in the form of electromagnetic waves which possess both electrical and magnetic properties.	Sunlight
Nuclear Energy	The potential energy stored in the nucleus of an atom.	Nucleus of uranium used in nuclear power
Gravitational Energy	The potential energy of place or position due to gravitational pull.	Wrecking ball on a crane

Efficiency

Work Energy	Electrical Energy
1BTU	0.293 Wh
1 cal	0.00116 Wh
1 J	0.000278 Wh
1 ft-lb	0.000377 Wh

Suppose we use an electric motor with 80% efficiency to lift a bin. How much electrical energy is require to lift an 60 **lb** bin 12 **ft** in the air?

$$\text{Work} = \text{Force} \times \text{Distance}$$
$$= 60 \text{ lb} \times 12 \text{ ft}$$
$$= 720 \text{ ft-lb}$$

$$\text{Efficiency} = \frac{\text{useful energy output}}{\text{energy input}}$$
$$0.80 = \frac{720 \text{ ft-lb}}{T}$$
$$0.80T = 720 \text{ ft-lb}$$
$$T = 900 \text{ ft-lb}$$

Conversion

$$\frac{900 \cancel{\text{ft-lb}}}{1} \times \frac{0.000377 \text{ Wh}}{1 \cancel{\text{ft-lb}}} = 0.339 \text{ Wh}$$

Principles

Power

$$\textbf{Power} = \frac{\text{work}}{\text{time}}$$